ELLIOTT

The Design of Gravity Yards

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THE DESIGN

OF

GRAVITY YARDS

BY

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This is to certify that the following thesis prepared under the immediate direction of Mr. R. B. Slippy, Instructor in Civil Engineering, by

HIRAM WASHBURN ELLIOTT

entitled THE DESIGN OF GRAVITY YARDS

is accepted by me as fulfilling this part of the requirements for the Degree of Bachelor of Science in Civil Engineering.

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THE DESIGN
OF
GRAVITY YARDS

INTRODUCTION

Gravity yards have been in successful operation in this country for the past thirty years or more. In 1875, such yards, constructed at Hoboken, N. J., for handling tidewater coal for the Lackawanna Line, gave excellent results. Since that time the gravity system of switching has been gradually developing until at present, a large percentage of our more important railway terminals contain switching yards in which the force of gravity is made use of to a considerable extent.

In the following discussion the writer will adhere to the term "gravity yard", meaning any yard in which the cars are switched by gravity, and hence will include such terms as "hump-yard ", "summit yard", and "coasting yard".

It will be the object (1), to make a comparison of the existing conditions as seen in yards now in operation in Illinois, (2) to enumerate some of the distinguishing features of more distant yards, and (3) to show where improvements can be made in the future developement of the gravity system of switching.

GENERAL THEORY OF SWITCHING.

As soon as a train comes in from the road and is received in the yard, the engine must immediately go to the round-house, the caboose must be put on the caboose track, the train inspected, and the cars marked for classification. This should not occupy more than one hour and a half, at the longest, and, in most cases, can be done in one hour. This time includes delays for slight repairs which should be made at this time to avoid the additional movements to and from a repair yard. The train is then ready for classification, and is taken to the classification yard where there should be enough body tracks to cover all classifications. This is especially essential in a gravity yard where all movements are, or should be, in one direction only. In a push and pull yard, however, it is not so essential to make all classifications at once because of the necessarily large number of backward movements incidental to that method of switching.

After the train is made into station order, the caboose attached, and the inspection made, it is ready to move forward. The time of ordinary freight in a terminal yard, from the time of receipt until departure, need not exceed four hours. Expedited freight can readily be put through in one hour, and freight that must be transferred, rearranged, shifted, or otherwise given extra handling, should not be detained more than twelve hours. These requirements as to time are essential both for economy, and, account conditions of competition.

TIME AND COST OF HANDLING CARS.

Mr. C. L. Bardo, in a paper on yard design read before the New York Railway Club in January, 1904, states that the gravity system requires only one-fourth of the time of ordinary switching and two-fifths of the time of poling. At McKees Rock, on the Lake Erie, the cost of handling a car over the summit of the gravity yard was nine cents, and at East Oak Island on the Lehigh Valley the yearly average was eleven cents. Mr. Bardo states that the damage to equipment in handling 253,000 cars at East Oak Island, chargeable to the hump grade, was less than $800, or about 0.316 cents per car, which was considerably less than the damage to cars when the yard was operated by poling.

On November 2, 1899, some tests were made over the Honey Pot hump of the Pennsylvania Railroad; 176 cars were handled in six drafts, each car was cut and weighed as it passed over the scale, the whole being done in one hour and three minutes.

Mr. L. C. Fritch, Ass't. Gen. Mgr. of the Ill. Central Railroad, in a lecture delivered before the railway classes of the University of Chicago, on Railway Terminal Facilities, makes a comparison of the three methods of switching (see Table 1); viz, level, poling, and hump. It consists of the record of a test made in classifying a sixty-car train by each of the three methods.

TABLE 1.

COMPARISONS BETWEEN THREE METHODS OF SWITCHING			
	METHODS OF SWITCHING		
ITEMS	LEVEL	POLING	HUMP
NO. OF CARS	60	60	60
NO. OF CUTS	50	50	50
NO. OF MEN	5	9	9
TIME CONSUMED	2 hrs.	1 hr.15m	30 min.
WAGE EXPENSE	$2.44	$1.55	$1.02

One would naturally think that, since the operations of the gravity yard are the faster, more damage to equipment would result than under the old methods, but Mr. Bardo's statement of damage at East Oak Island, just above, shows the contrary.

The Linwood yard of the P. C. C. &. St. L. Railway, near Cincinnati, Ohio., was built in 1904, and is for westward business only, which amounts to 400 cars daily. The standing capacity is 656 cars and the working of the hump is very satisfactory. A 30 car train can be classified in 35 to 40 minutes. The P.C. C. &. St. L. yard at Logansport, Indiana, (see Plate 12) in ordinary weather, requires from twenty to twenty-five minutes to break up a train of 85 cars over the hump, and, in zero weather,

about 50 minutes. At the westward hump of the Pittsburg, Ft. Wayne & Chicago Railway at Crestline, Ohio, under good working conditions, it takes a consolidation engine (weighing 124,800 lbs) about ten or twelve minutes to dispose of a train of 35 cars into 18 cuts over the hump. The switches are handled by mechanical levers in a nearby tower.

THE RECEIVING YARD

The receiving yard should have tracks of a sufficient length to admit, without doubling in, the longest trains that can be anticipated. To provide for the shorter trains and not block the entire length of track, a number of cross-overs should be placed to thoroughfares. A receiving yard is not a storage yard and should not be used as such. To provide for cars without Way-Bills, and cars of unconsigned lumber, coal, etc., a few storage tracks of moderate length, operated by the ordinary switching methods, should be placed at one side of the receiving yard. This storage yard should be readily accessible from all parts of the whole yard. The number of tracks in the receiving yard is determined by the maximum number of trains to be expected at or about the same time.

One track known as an "engine lead", should extend directly from the round-house to the receiving yard. Too much stress can not be put upon the fact that slight repairs should be made in the receiving yard before the train is classified. These repairs can often be made in a very few minutes, while, if the car were

sent to the repair yard, several days would elapse before it could be forwarded.

THE CLASSIFICATION YARD

One of the strongest points in favor of a gravity yard is rapid switching, and the reason why it is rapid is because the cars are moved in one direction only. Therefore, since there should be no backward movements in a gravity yard, all classifications should be made at one passage over the hump. The number of tracks in a classification yard, then, is determined by the number of classifications necessary, and these may be obtained from the agent or yard master. To amply provide for future growth and emergencies, two or three additional tracks should be put in. At the outlet end of the yard the work, so far as possible, should be confined to that of assembling the groups of cars from the different tracks into a train. The little additional switching at the outlet end of a separating yard necessary to put cars into train order may be accomplished by the ordinary methods.

It is the opinion of a great many efficient operating men that the length of tracks in a classification yard should be equal to that of a maximum train, but the writer believes that this is too great and that from 50 to 75 per cent of the maximum train length is, in most cases, sufficient. If conditions are such that slow freight accumulates rapidly in train lots, with practically no train order work needed, a few tracks of extra length may be

provided. However, where the classifications are made into train lots directly and not into station order, the maximum train length tracks are necessary and should be provided.

The proper gradient for this yard is treated under the heading of "GRADES".

THE FORWARDING YARD.

As soon as the cars are classified and put into train order, they should be taken directly to the forwarding yard. In connection with this yard should be a caboose track and air-test appliance. The tracks of the forwarding yard should be equal in length to the maximum train anticipated, and should be readily accessible from the round-house. Some railroad managers prefer that the caboose track be near the outgoing end of the yard, and that the caboose be put on as the train pulls out, while others insist that the caboose be put on before the train starts. The writer believes that the caboose track should be connected at the outgoing end of the yard, and built with a slight gradient, so that the caboose may be put on by gravity as the train pulls out. This arrangement, it is claimed, has been used successfully, requires no switching, and is a time-saver.

THE REPAIR YARD.

The repair yard should be so situated that the bad order cars can be classified over the hump and then <u>pushed</u> directly into such yard. The tracks should be spaced in pairs of 16 feet centers and 40 to 50 feet center to center of pairs,

thus allowing room for a material or supply track between each pair of working tracks. The repair yard should be accessible from both ends to allow for the removal of repaired cars.

GRADES

The grades used in the earlier gravity yards proved to be too light to give good results and the general tendency in later years has been to increase them. In deciding upon the proper grades, there are several factors to be taken into consideration. (1) The tractive resistance of the car; (2) the length of track; (3) alignment; (4) whether cars are loaded or empty; (5) general plan of yard; and (6) climatic conditions.

The tractive resistance of a hard running car is, perhaps, the most decisive feature in the establishment of the grades of a gravity yard. It is the hard running car that stops before it reaches its destination and causes so much delay.

The length of track does not, theoretically, affect the grade, but, practically, it does. After the car is given its initial momentum, it is carried on by what is known as a continuing grade, which grade is just sufficient to keep the car moving at a constant velocity. The many variable forces tending to stop the car affect its progress in such a way that the longer the track, the steeper the grade required to move the car to its end.

Another factor to be considered is the alignment. If the track is on a curve, more force is required to overcome the frictional resistance, hence a steeper grade.

If it were possible, it would be advantageous to have separate grades for loaded and empty cars. Experiments show that the grades required for empty cars are two or three times too great for the loaded cars. This necessitates the controlling of the loaded cars by brakes. However, the many factors which enter into the design of a gravity yard render it impractical to attempt to provide separate classification yards for loaded and empty cars.

It is scarcely necessary to say that a track which is cut up with many frogs and switches, offers greater resistance to the progress of a car than one which is not. Ladder tracks, therefore, require an additional grade.

Where the weather becomes very cold it is found that the ordinary momentum grades are not sufficient. In fact, the effect of cold weather upon the efficiency of a gravity yard is of greater extent than has hitherto been considered. The C. B. &. Q. yard at Galesburg, Ill., has a momentum grade of 3.5 per cent for about 300 feet, and Mr. B. Lantry, the yard master, informed the writer that, during a three day period of zero weather, the yard was in great danger of congestion due to the slow movement of the cars and to their failure to reach their destination. There are at least two ways of remedying this serious defect, (1) by building the grade steep enough to move the hardest running car in the coldest weather, and depending largely upon the brakes in warm weather, or

(2) by making an adjustable hump. The first method is the one commonly used, and the latter is only possible where the scales are not located on the hump. If space permitted, and the necessity were great enough, there might be two parallel humps, of different grades, connecting with a joint ladder lead. The writer does not know of any place where this scheme is made use of, but does not see any reason why it might not be an economical arrangement.

The classification tracks of the Peoria and Pekin Union Railway at East Peoria are given an initial grade over the hump of 2.5 per cent for 300 feet. This is followed by about 1200 feet of one per cent and 500 feet of 0.4 per cent in the opposite direction. Mr. W. C. Cushing, of the Pennsylvania Lines West, in May, 1905, recommended "0.4 per cent for the classification tracks, 3/4 to 1-1/4 per cent for loaded cars on the ladder, 1-1/4 to 1-1/2 per cent for empty cars on the ladder, and 3-5/10 per cent for the initial grade at the hump." Mr. H. M. North, Ass't. Eng. of Construction of the Lake Shore, in a paper before the Western Society of Engineers in January, 1907, recommended the following grades for the gravity system; "for loaded cars, 3 per cent; for empty cars, 4 percent; ladder grade for loaded cars, 0.7 to 0.9 per cent throughout; for empty cars, 1 to 1.2 per cent; continuing grade through the yard for loaded cars, 0.2 to 0.3 per cent, for empty cars, 0.3 to 0.4 per cent. The heavier grades are preferable in northern climates." Mr. North bases his conclusions upon the

examination of the yards whose important grade characteristics are given in Table 2.

TABLE 2.

GRADE CHARACTERISTICS OF GRAVITY YARDS NOW IN OPERATION#

RAILWAY	LOCATION	YARD	GRAVITY HUMP LENGTH	GRAVITY HUMP GRADE	LADDER GRADES
C.U.T.RY.	Clearing, Ill.	Both ways	200 ft	4.0%	0.9%
P.F.W.&.C.	55th St. Chgo	" "	150 "	3.0%	0.5%
P.C.C.&.StL	Logansport, Ind	Eastbound	125 "	2.4%	0.5%
"	" "	Westbound	250 "	1.4%	0.4%
L.S.&.M.S.	Elkhart "	Both ways	200 "	4.0%	1.0%
"	Collinwood, O	" "	200 "	4.0%	1.0%
P.F.W.&.C.	Conway, Penna	Eastbound	210 "	3.0%	1.0%
"	" "	Westbound	480 "	1.8%	10.6%
Penna R.R.	Altoona, "	Eastbound	185 "	4.5%	0.9%
" "	" "	Westbound	125 "	4.0%	0.9%
" "	" "	"	100 "	2.5%	1.3%
P.C.C.&.StL	Scully, "	One only	100 "	2.5%	1.3%
Penna R.R.	Harrisburg, "	Westb'd#4	150 "	3.6%	1.2%
" "	Fairview "	Eastbound	150 "	3.6%	1.2%
" "	" "	Westbound	125 "	5.5%	1.0%
" "	Marysville "	Eastbound	250 "	2.5%	1.2%
" "	" "	Westbound	225 "	2.0%	1.2%
" "	Alexandria, Va.	Both ways	100 "	2.5%	1.0%
" "	Greenville, N.J	Tidewater	50 "	2.5%	1.0%

#taken from H.M.North's paper on The Theory of The Design of Terminal Yards.

Note:-Profiles of some of these yards are shown on plates 7 to 12.

It is generally agreed among the operators of gravity yards that, for ordinary climates, a momentum grade of 3 per cent to 5.5 per cent, according to the length, will give very satis-factory results. A 0.5 per cent grade is generally sufficient to keep a hard running car in motion until it reaches the end

of the body track where a level or slightly ascending grade will stop it.

A strong wind will affect the movement of an empty car very greatly, so much, in fact, that a great amount of trouble has been experienced on its account. A yard that classifies westward should be given an increase of about 25 percent in its grades.

FROGS, LEADS, CURVES, ETC.

The matter of the size of frogs, the length of leads, the allowable degrees of curvature, and all the minor details of a gravity yard, which, in themselves may not seem to have much influence on the whole design, are, nevertheless, of considerable importance. For instance, the larger the frog, the longer the lead, and the greater distance required center to center of tracks. This can be overcome somewhat by increasing the ladder angle and putting in a curve for a short distance behind the frog. This plan was used in the East Peoria yard of the Peoria and Pekin Union Railway, (see Plate 6) where a No. 7 frog was used with a 10°-47' ladder angle and about 20 feet of a 12°-30' curve behind the frog. With 13 ft. centers and the frog lead shortened up to 59 feet, this arrangement left 3 feet between the end of one frog and the next point of switch. This practice is becoming very common among most of the engineers. Mr. H. M. North, quoted above, considers that

the angles of frogs in general use heretofore have been too large, and, in a terminal yard where switching is constant, a frog with a greater angle than a No. 8 should not be permitted. In receiving and forwarding yards where the road engines must move in the approaches to the hump in the gravity yards, the frog should be at least No. 9, and No. 10 if practicable.

When the seriousness of the derailment of an engine or car near the hump during a busy time is considered, too much stress cannot be laid upon the importance of making the frogs easy enough to avoid all such mishaps. The writer finds that No. 9 frogs are coming into use more in the last few years. A little added expense at the outset will more than pay for itself in a short time in the saving of repairs due to derailments. The enormous engines used for hump engines are very destructive of switch leads, and will derail themselves frequently if the leads are sharp.

A gravity yard differs from an ordinary yard in that a slight defect in its construction affects the economical working materially. This is especially true of the classification yard. If possible, nothing but new 75 or 80 lb. rail on sound ties, well ballasted, should be used. Cinders make a good ballast and are easily procured. Special care should be taken that the ladder tracks are well ballasted because they are the framework and most vital points of the yard.

THE TRACK SCALE.

The question of the location of the track scale in a gravity yard is one of the most annoying problems of the design. A great many engineers place the scale on the descending side of the hump and claim very good results. In this case the gravity ratios have to be adjusted to properly move cars for weighing, which is not the most advantageous for other freight. If a large percentage of the business requires weighing, this would probably be the quickest method.

Another method which is coming into use more in the past year or so, is to put the scales on a separate track alongside the classification yard. Then the cars to be weighed are classified on this track, and, after the track is full, are pulled back to the receiving yard and reclassified over the hump. It appears to the writer that, where there are many cars to be weighed, or where the cars are classified into station order, that a great deal of trouble would be experienced in this method.

Where the scale is placed on the hump (i.e. just over the crest) the following method of operation is generally employed: If a train contains one or more cars to be weighed, the entire train is run over the scale track and the plug of the automatic weighing device is pulled out as those cars to be weighed pass over. In this way no time is lost in weighing

and reclassifying and the cut may move as fast as desired, except when the cars to be weighed are passing over. Of course, there will be more wear on the scales but the time and expense saved will more than pay for the additional wear.

The scale in the C. B. &. Q. yard at Galesburg is placed on the hump, and the yard master informs the writer that it causes no trouble whatever. There is no doubt in the mind of the writer but that the speed of the car as it passes over the hump is sufficiently slow to permit accurate weighing, and that the hump is the proper place for the scale.

LIGHTING.

The lighting system of a yard is now recognized as of great importance, and large sums of money are now being spent for that purpose by many companies. The electric lights, as ordinarily used, are not sufficiently effective, and the cars are handled slowly as a result.

Mr. M. E. Shire, Engineer in Charge of "Clearing Yards", Chicago, has developed a device like a reflector of a locomotive headlight; each light is equipped with one of these reflectors placed so the rays of light are directed toward the important channels of the work. (See Plate 5) The advantage of this arrangement is that the light is directed where it is most needed, and is withheld from shining into the faces of the riders.

Mr. B. Lantry, yard master C. B. &. Q. at Galesburg,

suggested to the writer that an ordinary searchlight, operated from a tower near the hump, might be an effective solution of the lighting problem. Whatever the arrangement, deep shadows are to be avoided, the light kept from shining into the eyes of the switchmen, and directed where it is most needed. The switchmen sometimes supplement a system of lighting by placing a lantern at the end of the last car on each body track.

RETURNING THE RIDERS.

In a yard of any considerable length some means of bringing the riders back to the hump must be provided. For this purpose there should be a separate track about midway of the yard, upon which either some old light engine, trolley car, or gasoline car could be run. The uncertainty of gasoline cars has resulted in their rejection, while the old light engine or electric car has proven most efficient. Perhaps the trolley car is the cheaper device.

OPERATION OF LADDER SWITCHES.

The operation of the ladder switches of a gravity yard by switch tenders is, probably, the most satisfactory method. Electropneumatic systems are used in some of the larger yards, and, although they are the most economical, are somewhat slower in operation. The expense of individual switch tenders is large, and the operation of the electropneumatic system, under nearly all conditions, is swift enough.

EXPLANATION OF PLATES.

Plate 1.

This plate shows some views, taken by the writer, of the C. B. &. Q. gravity yard at Galesburg, Ill.

Fig. 1 shows the eastbound hump with the scale house at left, and the tool house at right, of summit.

Fig. 2 is a view taken from same position as Fig. 1, showing eastbound classification yard and westbound hump.

Fig. 3 is a closer view of the westbound hump.

Plate 2.

This plate shows some of the writer's views of the P. &. P. U. gravity yard at East Peoria, Ill.

Fig. 1 is taken from the yard office beside the hump and shows a view of the receiving yards.

Fig. 2 is taken from the same place, and shows the hump, classification yard, scale house, and two engine leads on either side of the hump track.

Fig. 3 shows the north end of half of the receiving yard looking toward the hump. This view was taken before the yard was ballasted.

Plate 3.

This plate is a continuation of Plate 2.

Fig. 1 shows the south end of the classification yard, somewhat obstructed by a cut of stock cars. The office

building and hump are seen in the distance.

Fig. 2 is a closer view of the office building and hump.

Fig. 3 shows a close view of the classification ladder and yard. To the right is seen the scale house.

Plate 4.

This plate shows a plan and profile of a proposed terminal yard for East St. Louis. The plate is self-explanatory. For this and Plate 5 the writer is indebted to Mr. H. M. North of the Lake Shore Railway.

Plate 5.

This plate shows two views of a satisfactory means of lighting a gravity yard.

Plate 6.

This plate shows a plan and profile of the East Peoria yard of the Peoria and Pekin Union Railway. For this plate the writer is indebted to Mr. Stanley Millard, Chief Engineer P. &. P. U.

Plates 7 to 12.

These plates show plans and profiles of some of the yards mentioned throughout this work, for which the writer is indebted to Mr. W. C. Cushing, Chief Engineer M. of W. Southwest System Pennsylvania Lines.

PLATE I

Fig. 1

Fig. 2

Fig. 3

PLATE II

Fig. 1

Fig. 2

Fig. 3

PLATE III

Fig. 1

Fig. 2

Fig. 3

PLATE IV

CONDENSED OUTLINE OF PROPOSED TERMINAL YARD
FOR EAST ST. LOUIS TERRITORY
MISSOURI PACIFIC SYSTEM
LOCATED AT DUPO ILLINOIS

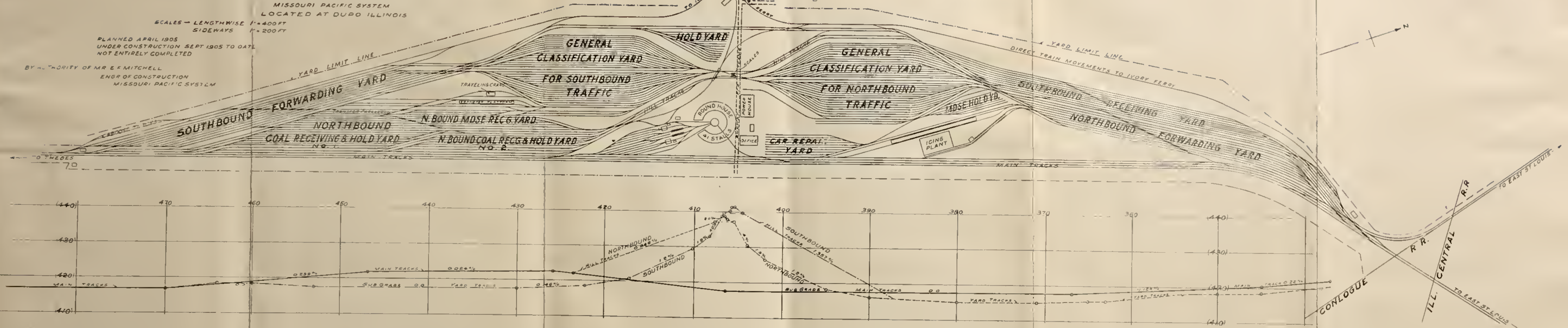
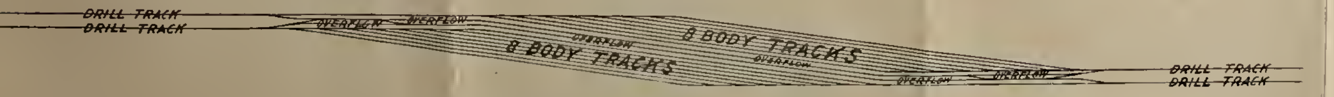


PLATE 1.

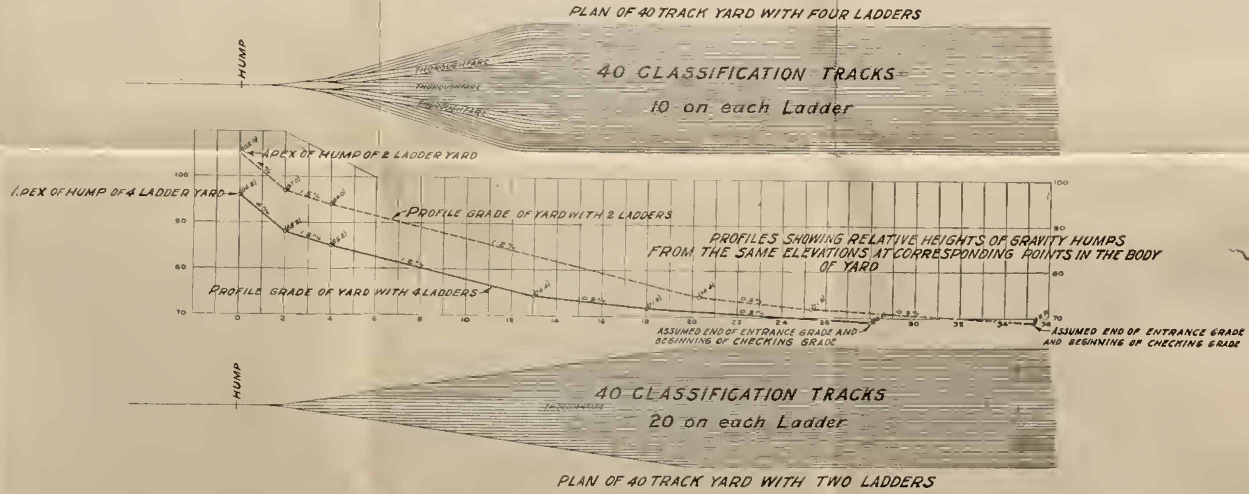
OUTLINE OF UNITS OF TYPICAL YARD FOR SWITCHING BY THE USUAL PUSH AND PULL METHOD
EIGHT BODY TRACKS PER LADDER ADAPTED TO POINTS WHERE SIX CLASSIFICATIONS WILL USUALLY SUFFICE IN MAKING UP TRAINS

PLATE 2.



OUTLINE OF YARD FOR SWITCHING BY THE USUAL PUSH AND PULL METHOD
EIGHT BODY TRACKS PER LADDER ADAPTED TO POINTS WHERE BUSINESS CONTINUALLY REQUIRES MORE THAN SIX CLASSIFICATIONS IN MAKING UP TRAINS

PLATE 3.



COMPARISON IN A GIVEN YARD OF 40 BODY TRACKS, OF THE RELATIVE HEIGHTS OF GRAVITY HUMPS BETWEEN THE TWO LADDER METHOD AND THE FOUR LADDER METHOD OF DESIGN

PLATE 4.

PLATE V

PLATE 5.— FRONT VIEW OF ALTERNATING CURRENT ENCLOSED ARC LAMP WITH REFLECTOR FOR DIRECTING RAYS OF LIGHT FORWARD AND DOWNWARD

PLATE 5.— REAR VIEW OF DIRECT CURRENT LUMINOUS AND ALTERNATING CURRENT ARC LAMPS WITH REFLECTORS FOR DIRECTING RAYS OF LIGHT FORWARD AND DOWNWARD.

PLATE VI

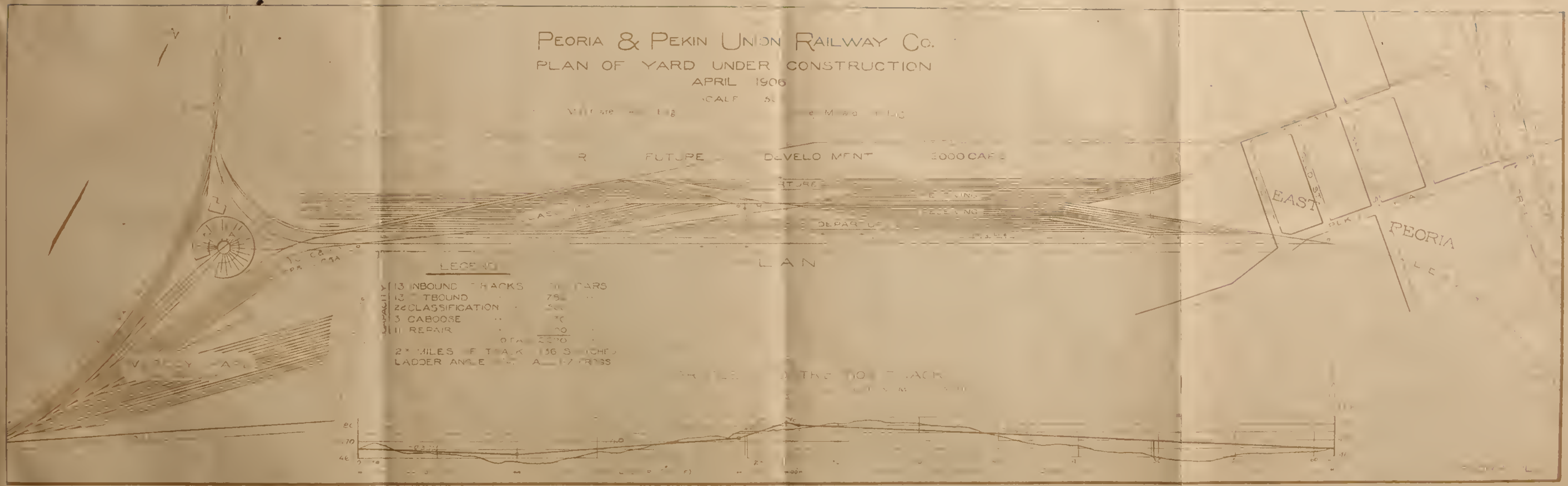
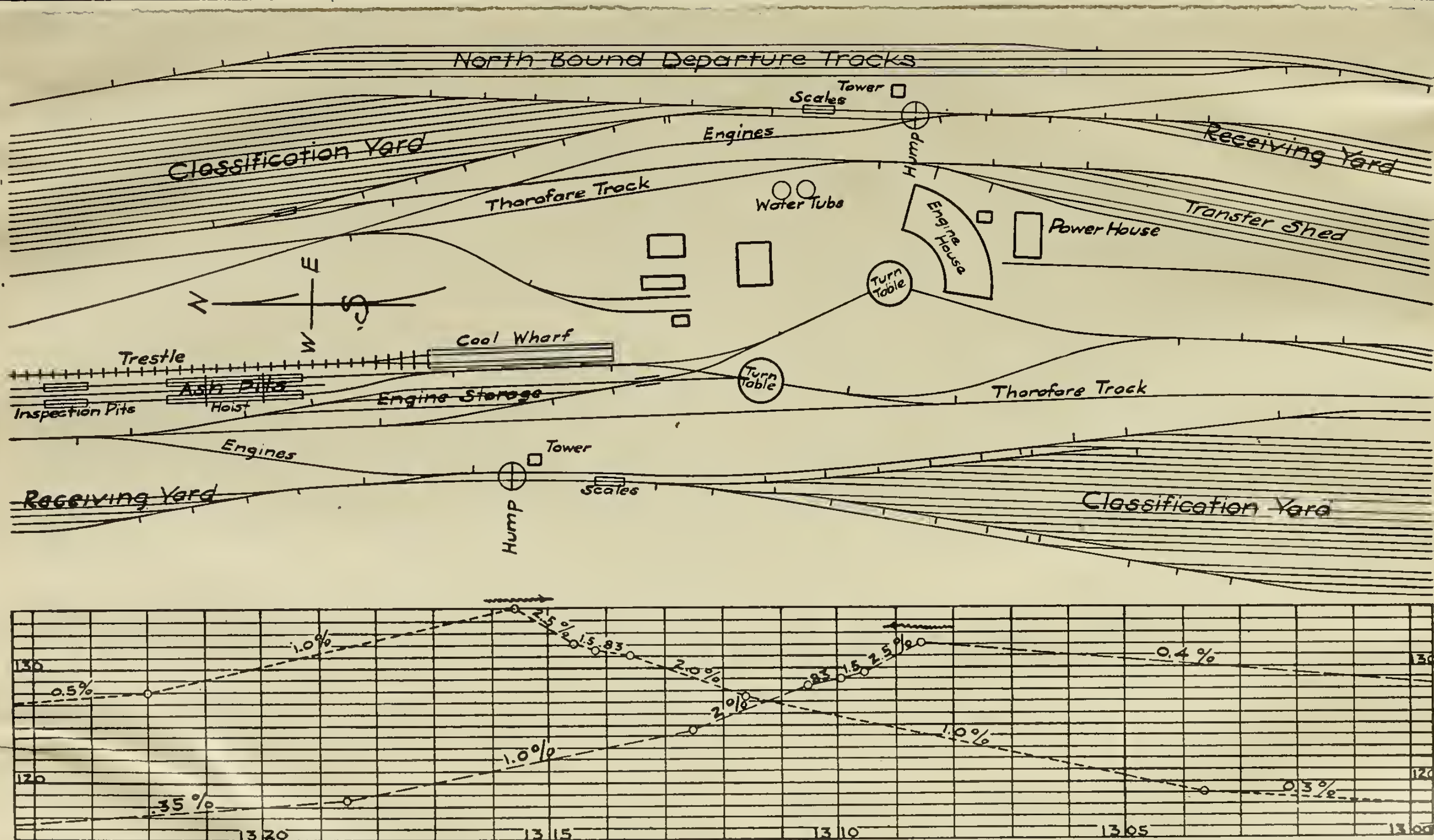

PEORIA & PEKIN UNION RAILWAY CO.
PLAN OF YARD UNDER CONSTRUCTION
APRIL 1906
FUTURE
LEGEND
13 INBOUND TRACKS
26 CLASSIFICATION
3 CABOOSE
11 REPAIR
EAST
PEORIA

PLATE VII



North Bound	Tracks	Cars	Car Cap. Each Trk.
Receiving	9	375	45-50
Classification	16	559	20-43
Departure	5	370	30-50
Total	30	1204	

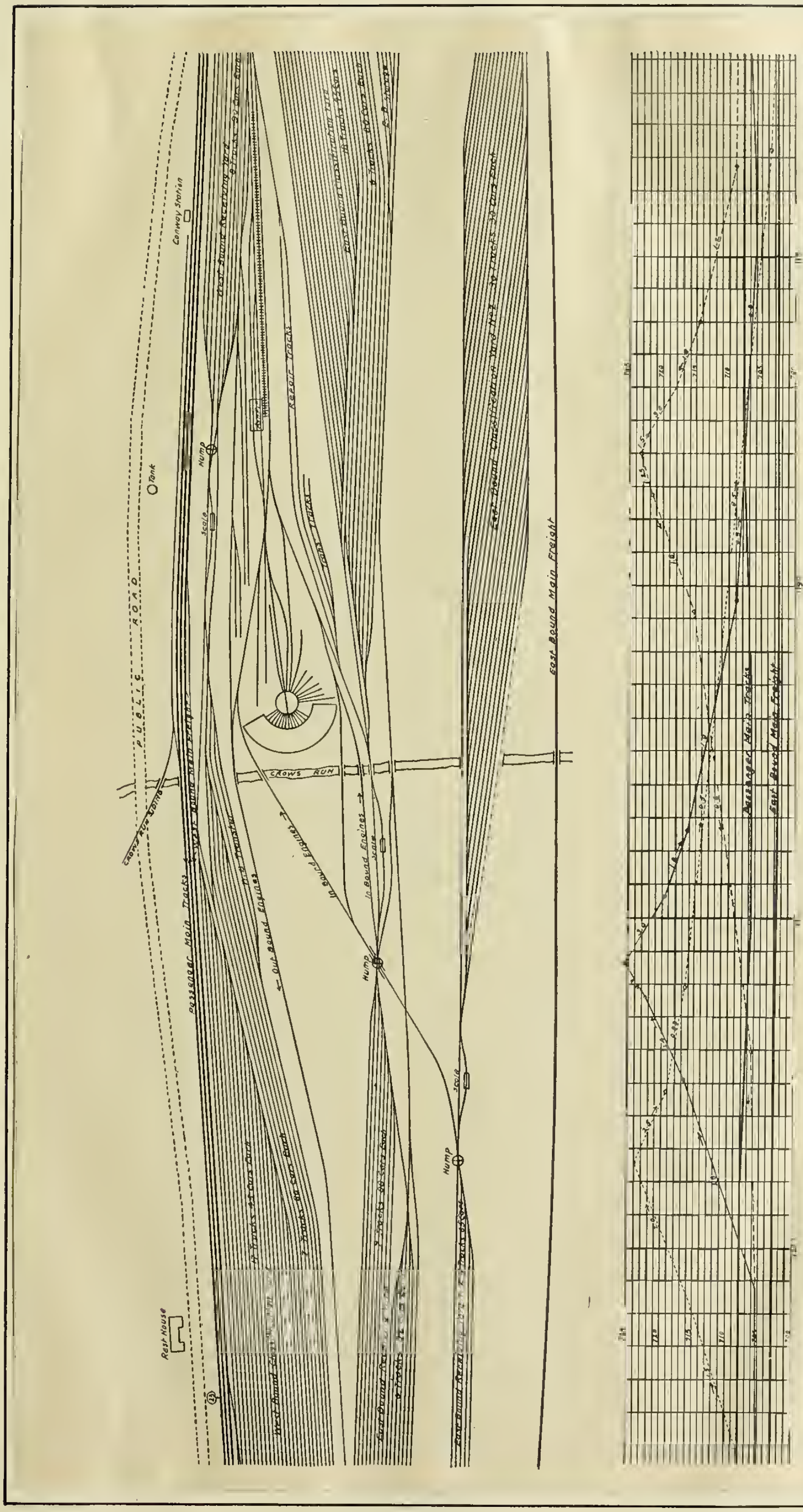
North Bound Yard	1204
South Bound Yard	1170
All Others	753
Total	3127

South Bound	Tracks	Cars	Car Cap. Each Trk.
Receiving	5	300	60
Classification	21	720	25-50
Departure	3	150	50
Total	29	1170	

Plan and Profiles of Hump Yards at Alexandria, Va.—Washington Southern Ry.

[Plans et Profils des Dépôts à Sommet à Alexandria, Va.—Ligne "Washington Southern."]

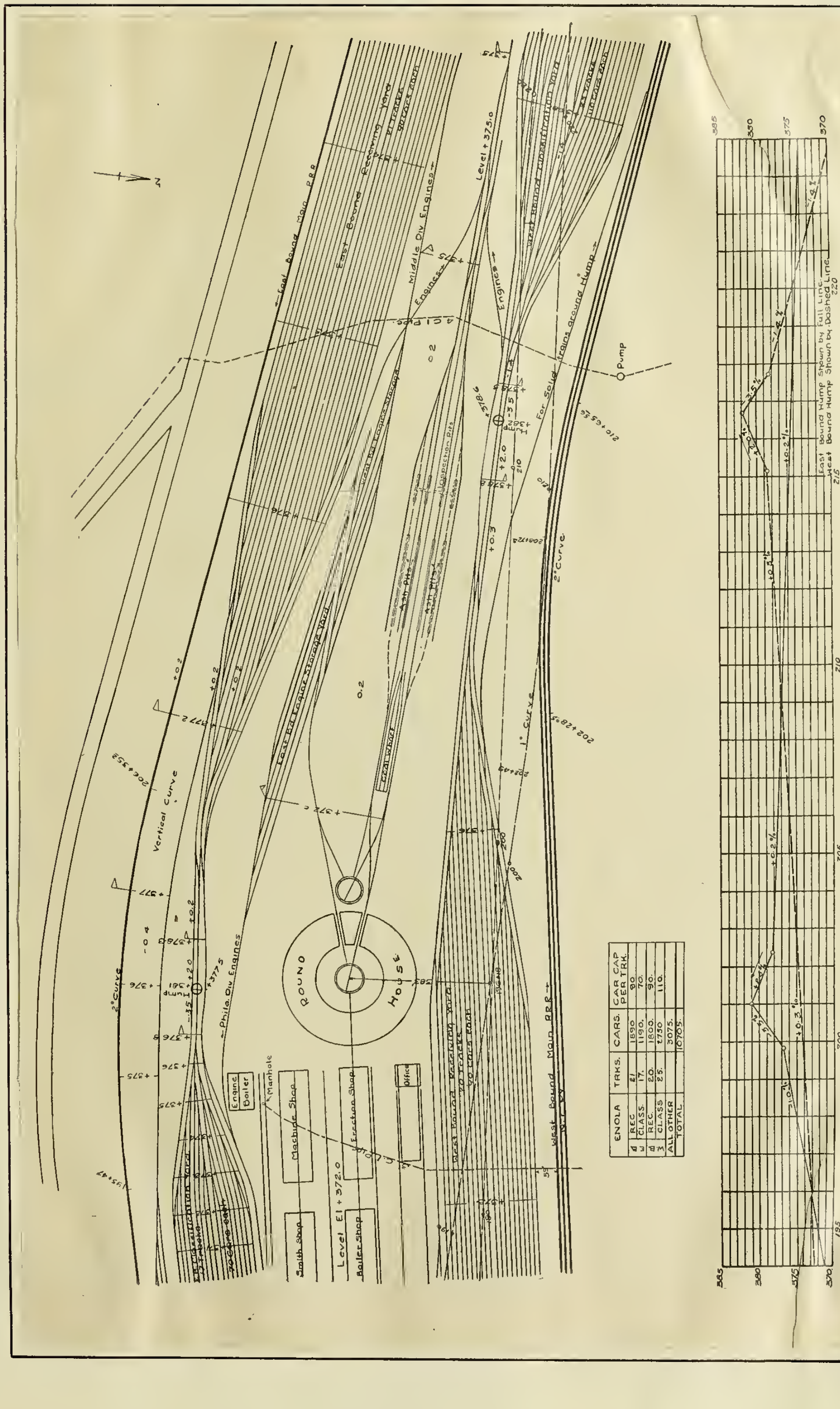
PLATE VIII



Plan and Profile of East and West Bound Humps, Conway, Pa., Yard.—Pittsburg, Ft. Wayne & Chicago.

[Plan et Profil des Sommets de l'Est et de l'Ouest au Dépôt de Conway Pa.—Ligne "Pittsburg, Fort Wayne & Chicago."]

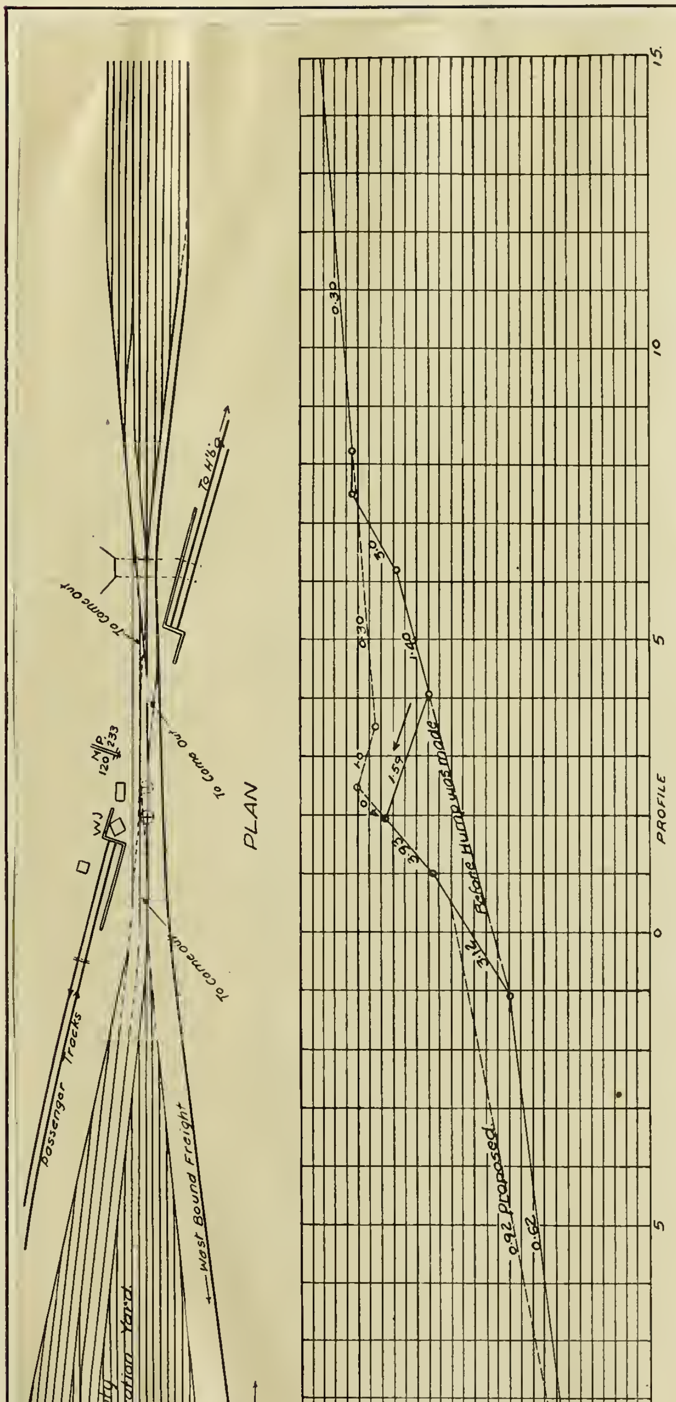
PLATE IX



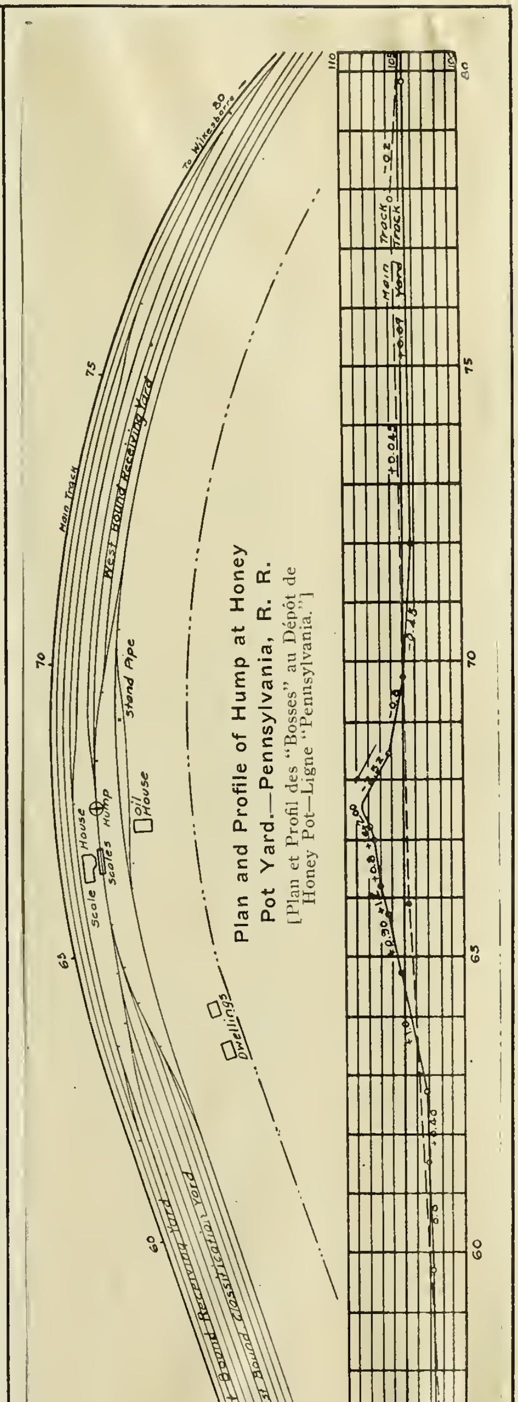
Plan and Profiles of Enola Yard, Fairview, Pa.—Pennsylvania Railroad.

[Plan et Profils du Dépôt Enola à Fairview, Pa.—Ligne "Pennsylvania."]

PLATE X

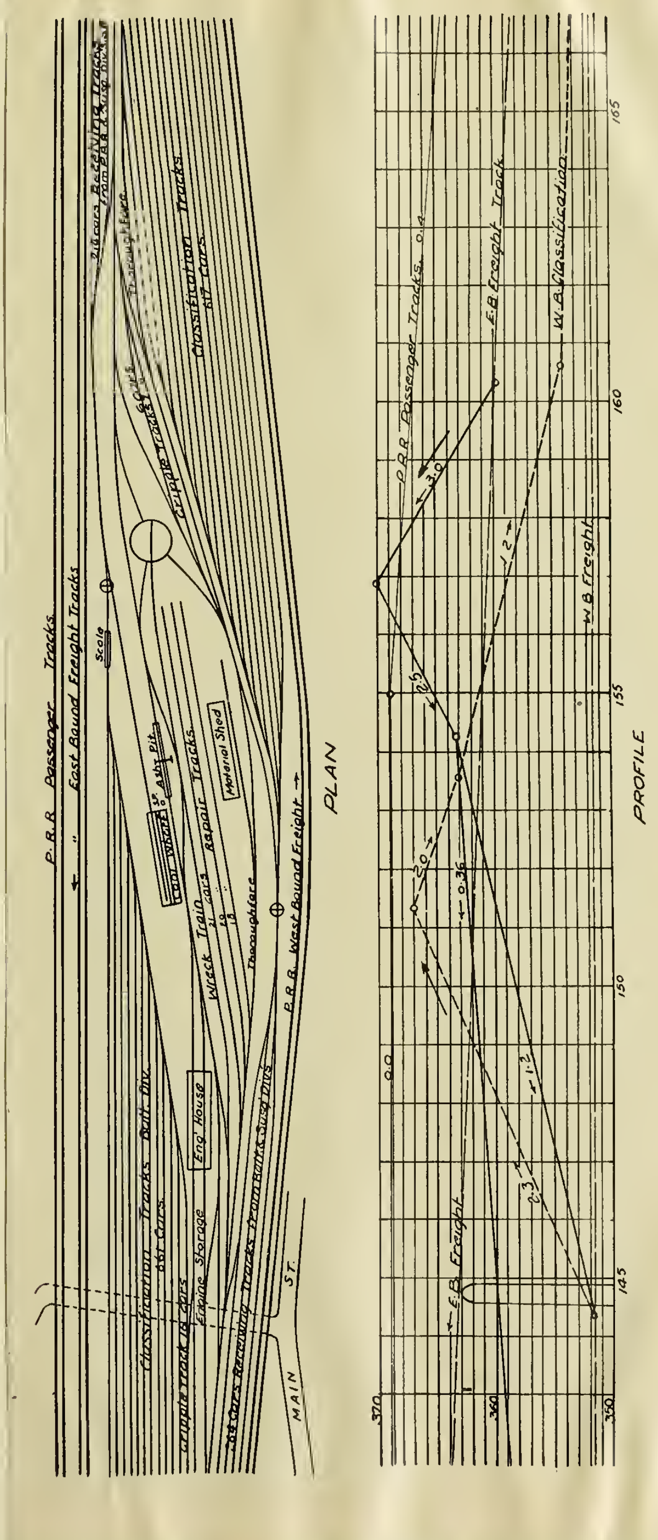


Plan and Profile of Hump at West Bound Gravity Yard, Altoona, Pa.— Pennsylvania Railroad.
[Plan et Profil de la "Bosse" au Dépôt à la Gravité de l'Ouest, Altoona, Pa.—Ligne "Pennsylvania."]



Plan and Profile of Hump at Honey Pot Yard.—Pennsylvania, R. R.
[Plan et Profil des "Bosses" au Dépôt de Honey Pot—Ligne "Pennsylvania."]

PLATE XI

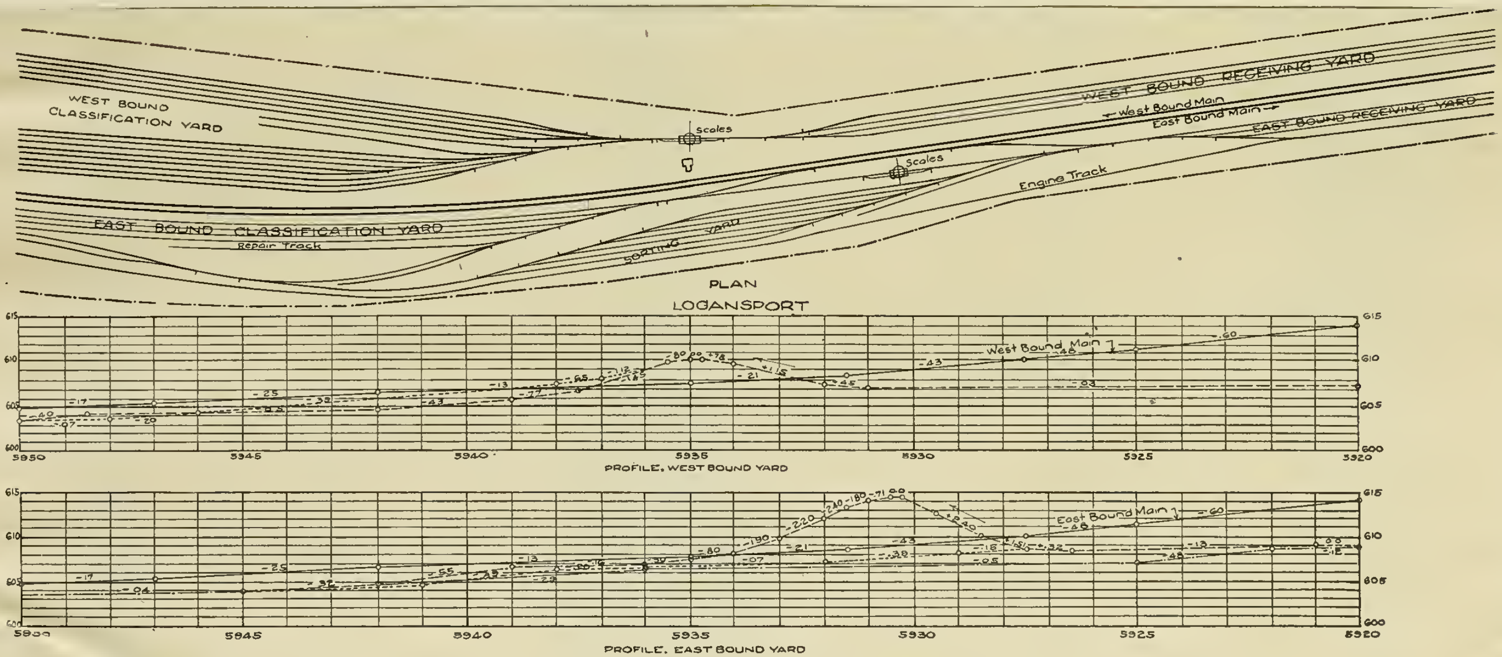


Marysville Yard		Tracks	Cars	Car pr Tk
N. or W.B.	Rec	4	264	64-68
	Class	15	617	9-67
S. or E.B.	Rec.	4	214	47-63
	Class.	11	661	43-67
	Total.	34	1756	

Plan and Profile of Hump at Marysville, Pa., Yard, Baltimore Division, Northern Central Railroad.

[Plan et Profil de la "Bosse" à Marysville, Pa., Dépôt de la Ligne "Northern Central," Division de "Baltimore."]

PLATE XII



Plan and Profiles of East and West Bound Hump Yards at Logansport, Ind.—P., C., C. & St. Louis.

[Plan et Profils des Dépôts à Sommet de l'Ouest à Logansport, Ind.—Ligne "Pittsburg, Cincinnati, Chicago & St. Louis."]